

IN THE CLAIMS

The following listing of the claims is provided in accordance with 37 C.F.R. §1.121:

1. (currently amended) A phantom for a volumetric computed tomography system, said phantom comprising:

an essentially transparent or partially transparent supporting structure; and
a plurality of discrete, essentially opaque markers spaced apart from one another on or in said supporting structure, said markers being spaced axially along said supporting structure and along a central axis of said supporting structure or circumferentially over not more than a revolution about said supporting structure and configured so as not to overlap when scanned over a range of view angles by [a] the volumetric computed tomography system, and said markers are configured on said supporting structure so as to permit separate identification of each said marker in a collection of projection images.

2. (original) A phantom in accordance with Claim 1 wherein said plurality of discrete, essentially opaque markers comprise spaced apart spheres, and one said sphere is larger in size than others of said spheres.

3. (original) A phantom in accordance with Claim 2 wherein said spheres are arranged in a linear array on or in said supporting structure.

4. (original) A phantom in accordance with Claim 2 wherein said spheres are arranged in a helical array on or in said supporting structure.

5. (original) A phantom in accordance with Claim 1 wherein said transparent or essentially transparent supporting structure comprises a wire frame cylinder.
6. (original) A phantom in accordance with Claim 1 wherein said transparent or essentially transparent structure comprises a solid plastic cylinder, and said plurality of discrete, essentially opaque markers are embedded in said solid plastic cylinder.
7. (original) A phantom in accordance with Claim 6 wherein said plurality of discrete, essentially opaque markers comprise a linear arrangement of spheres, and one said sphere is larger than other said spheres.
8. (original) A phantom in accordance with Claim 6 wherein said plurality of discrete, essentially opaque markers comprise a helical arrangement of spheres, and one said sphere is larger than other said spheres.
9. (currently amended) A method for determining geometry of a scanning volumetric computed tomographic (CT) system, said system having a rotation axis, a rotation plane, an x-ray source, and a detector, said method comprising:
- scanning a phantom having a series of spatially separated discrete markers with the scanning volumetric computed tomographic system, said markers configured on a supporting structure of the phantom so as to permit separate identification of each said marker in a collection of projection images;
 - locating images of the markers in each projection image;
 - using the located marker images to assign marker locations to tracks; and
 - using the assigned tracks[,] for determining a relative alignment between the detector, the source, and the rotation axis of the scanning volumetric computed tomographic system.

10. (currently amended) A method in accordance with Claim 9 wherein said determining a relative alignment between the detector, the source, and the rotation axis comprises utilizing orthogonal regression to fit each track to a line segment, and fitting a line through bisecting points of ~~said the~~ line segments to determine a projection of the rotation axis of the scanner onto the detector.

11. (currently amended) A method in accordance with Claim 10 further comprising determining residual errors between [a] said line segments and said tracks, and utilizing said residual errors to determine a projection of the rotation plane onto the detector.

12. (original) A method in accordance with Claim 11 further comprising utilizing the determined projection of the rotation plane and the determined projection of the rotation axis to adjust a geometry of the scanning volumetric computed tomography system.

13. (original) A method in accordance with Claim 11 further comprising utilizing the determined projection of the rotation plane and the determined projection of the rotation axis to compensate an image reconstruction process of the scanning volumetric computed tomography system.

14. (original) A method in accordance with Claim 10 further comprising determining a magnification of the CT system utilizing a spacing between line segments fitted to the assigned tracks.

15. (original) A method in accordance with Claim 9 wherein the markers are metal spheres of equal size except for one metal sphere larger than the others.

16. (original) A method in accordance with Claim 9 further comprising adjusting a geometry of the scanning volumetric CT imaging system.

17. (original) A method in accordance with Claim 9 wherein the spatially separated discrete markers are spaced along a line parallel to the rotation axis of the volumetric CT imaging system.

18. (original) A method in accordance with Claim 9 wherein the spatially separated discrete markers are spaced along a helix.

19. (original) A method in accordance with Claim 9 further comprising orienting the phantom in the scanning volumetric CT imaging system so that trajectories of the scanned markers do not intersect one another.

20. (original) A method in accordance with Claim 9 wherein said using the located marker images to assign marker locations to tracks comprises using the located marker images to determine marker center locations, and assigning the determined marker center locations to tracks.

21. (currently amended) A method for determining geometry of a scanning volumetric computed tomographic (CT) system, said system having a rotation axis, a rotation plane, a radiation source other than an x-ray source, and a detector, said method comprising:

scanning a phantom having a series of spatially separated discrete markers with the scanning volumetric computed tomographic system utilizing the radiation source other than an x-ray source, said markers configured on a supporting structure of the phantom so as to permit separate identification of each said marker in a collection of projection images;

locating images of the markers in each projection image;

using the located marker images to assign marker locations to tracks; and
using the assigned tracks[,] for determining a relative alignment between the
detector, the source, and the rotation axis of the scanning volumetric computed
tomographic system.

22. (original) A method in accordance with Claim 21 further comprising
adjusting a geometry of the volumetric CT imaging system.

23. (original) A method in accordance with Claim 21 wherein the
spatially separated discrete markers are spaced along a line parallel to the rotation axis of
the volumetric CT imaging system.

24. (original) A method in accordance with Claim 21 wherein the
spatially separated discrete markers are spaced along a helix.

25. (original) A method in accordance with Claim 21 further comprising
orienting the phantom in the volumetric CT imaging system so that trajectories of the
scanned markers do not intersect one another.

26. (original) A method in accordance with Claim 21 wherein said using
the located marker images to assign marker locations to tracks comprises using the
located marker images to determine marker center locations, and assigning the
determined marker center locations to tracks.

27. (new) A phantom for a volumetric computed tomography system, said
phantom comprising:

an essentially transparent or partially transparent supporting structure; and
a plurality of discrete, essentially opaque markers spaced apart from one another
on or in said supporting structure, said markers being spaced linearly along a central axis

of said supporting structure and configured so as not to overlap when scanned over a range of view angles by the volumetric computed tomography system, and said markers are configured on said supporting structure so as to permit separate identification of each said marker in a collection of projection images.

28. (new) A phantom for a volumetric computed tomography system, said phantom comprising:
an essentially transparent or partially transparent supporting structure; and
a plurality of discrete, essentially opaque markers spaced apart from one another at varying radial depth within said supporting structure and configured so as not to overlap when scanned over a range of view angles by the volumetric computed tomography system, and said markers are configured on said supporting structure so as to permit separate identification of each said marker in a collection of projection images.